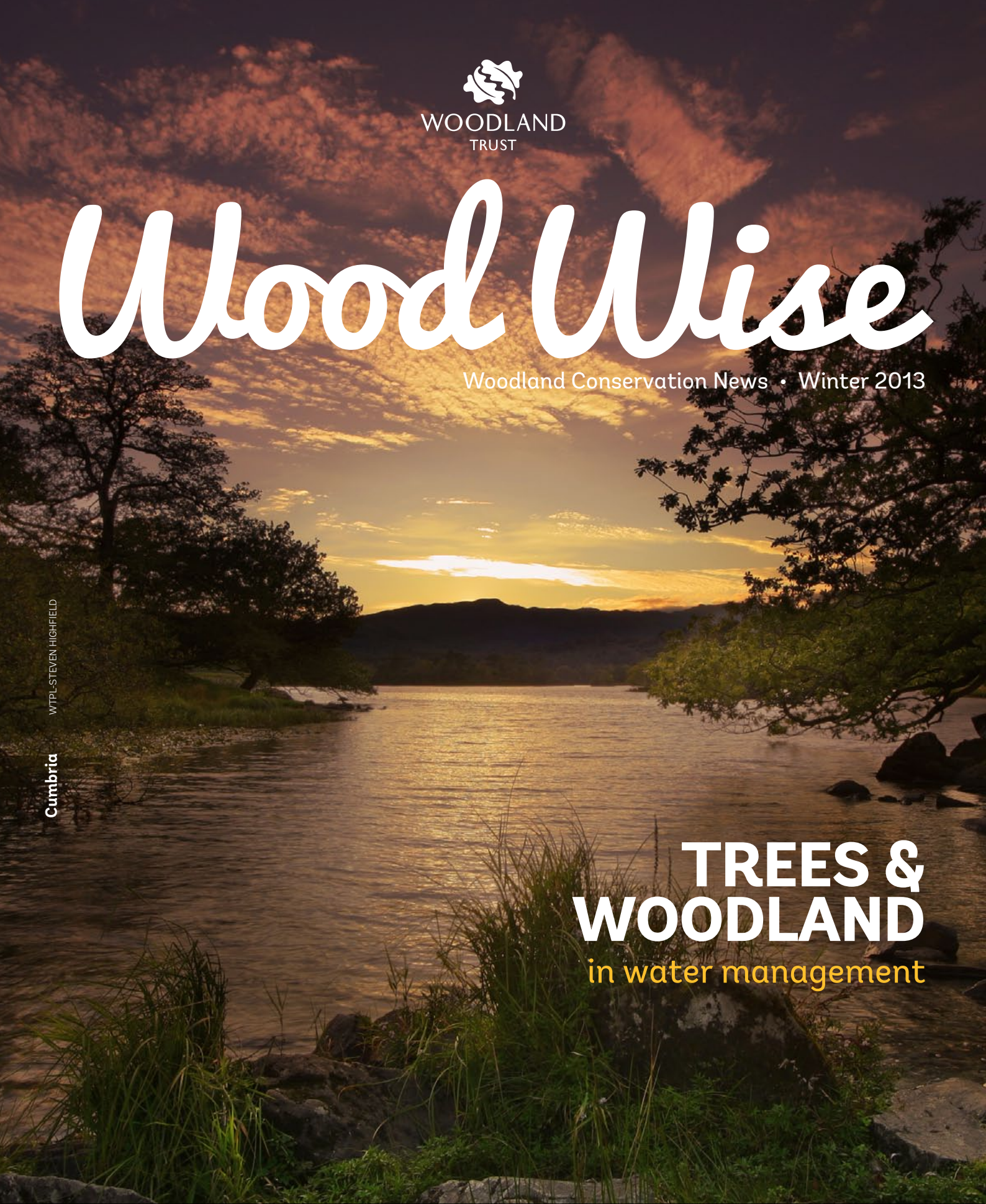
WOODLAND TRUST

Wood Wise

Woodland Conservation News • Winter 2013



Cumbria WTPL-STEVEN HIGHFIELD

TREES & WOODLAND
in water management

HAMPSHIRE AVON PILOT PROJECT
Keeping rivers cool

LAKE DISTRICT
Flood prevention & soil protection

PONTBREN PROJECT
Sustainable upland farming

SEVERN RIVERS TRUST
Catchment sensitive farming

Trees & water

WTPL

Flooding Tewkesbury 2007

Water is a precious resource for life on Earth, covering 70 per cent of the planet's surface. Yet only 2.5 per cent of the total volume of the world's water is fresh and less than 1 per cent of this is usable by ecosystems and humans – most is trapped as ice (for the time being). Overconsumption is a major issue for many important resources. The UN estimate we would need 3.5 planet Earths to sustain the global population if everyone consumed at the rate of the average European or North American.[1]

Yet over-consumption is not the only issue. Insensitive land management can also cause serious water related issues for ecosystems, biodiversity and humans. For example, the removal of trees and trampling of vegetation can destabilise banks along watercourses, allowing increased amounts of sediment to run into them during heavy rainfall.

Excessive suspended sediments in water bodies reduce the amount of dissolved oxygen available to fish and other aquatic life. They also reduce light penetration, which allows choking algal communities to replace the more delicate and important aquatic plants. As sediment settles out onto the bottom of a watercourse it can smother spawning beds and other habitats. This has a negative effect on many species of fish, invertebrates, plants, amphibians and birds.

Lack of vegetation can also contribute to an increased threat of flooding. Trees can help slow rainfall by intercepting it as it makes its way to the ground; this allows more time for soils to absorb water or relieves pressure on drains. Plant roots also provide pathways for water to follow, enabling it to more easily infiltrate the earth. Combined, these processes can reduce peak flows that cause flooding and increased soil erosion.

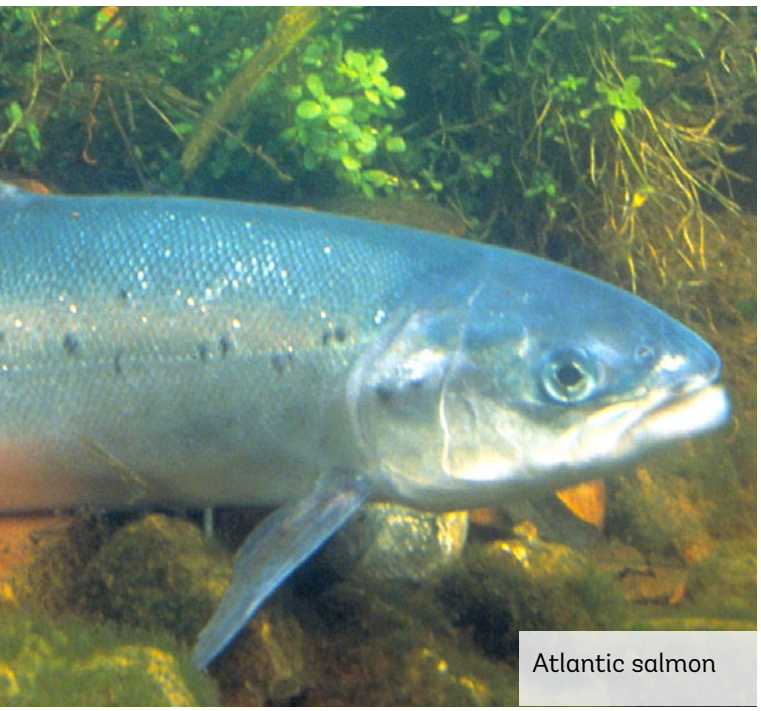
Woodland buffers can also act as filters by trapping toxins and chemicals, such as pesticides from agriculture and oil or grease from roads, preventing them washing into watercourses. In the soil natural processes can better breakdown these chemicals that can be extremely harmful to aquatic life.

In 2000 the European Water Framework Directive (WFD) came into force to deal with the need to improve poor water quality, it was enshrined in UK law in 2003 and the lead authority is the Environment Agency. The directive seeks to increase water quality standards through better land management and protection from pollution, and to drive more sustainable use of water. These actions should contribute to improved habitats for wildlife in and around watercourses and water bodies, and a better quality of life for everyone.[2]

A number of organisations are working on ways to use trees and woodland to deliver the aims of the WFD at local and catchment scales. The following case studies highlight a few of these, focusing on best practice and landscape scale delivery.

[1] *UN:* http://www.unwater.org/statistics_res.html

[2] *Environment Agency:* http://www.environment-agency.gov.uk/research/planning/33362.aspx



HARTLEY, WILLIAM W

Atlantic salmon

Keeping Rivers Cool – Hampshire Avon pilot project

Predicting the future is fraught with uncertainty. However, climate experts have tried to capture some of this uncertainty in the current set of scenarios for the UK, in the UKCP09 projections[1]. The models predict that average summer air temperatures will warm by between 2°C and 4°C by the 2050s compared to the long-term 1961-90 average temperature. River temperatures are sensitive to changes in climate and water temperatures are expected to rise by a similar amount[2]. It may not seem much, but even small changes can affect the health of wildlife living in freshwater. Brown trout, *Salmo trutta*, and Atlantic salmon, *Salmo salar*, are particularly vulnerable. A rise in water temperature above 22°C for more than seven consecutive days can be lethal for brown trout[3].

The Environment Agency is looking at ways to keep rivers cool and taking action to prevent, where possible, rivers becoming inhospitable for our freshwater wildlife over the next 60-70 years. Trout and salmon populations in England are already under stress, with some rivers reaching temperatures above the lethal limit for these species during recent hot, dry summers.

Historically, natural rivers, streams and their floodplains across the UK were much more densely wooded, and woody debris would have been a common feature in river channels[4]. Much of this tree cover has been lost and many rivers now lack shade. Riparian trees and shrubs can help reduce local stream temperatures on hot summer days. Summer mean and maximum water temperatures are on average 2-3°C lower in shaded than in open rivers[5]. The recommended shade levels for most streams is 50 per cent shading, but it is

30 per cent for chalk streams to allow plenty of open areas for in river plant growth. Salmon require a mix of different habitats to complete their life cycle, so we need a variety of habitats to support them.

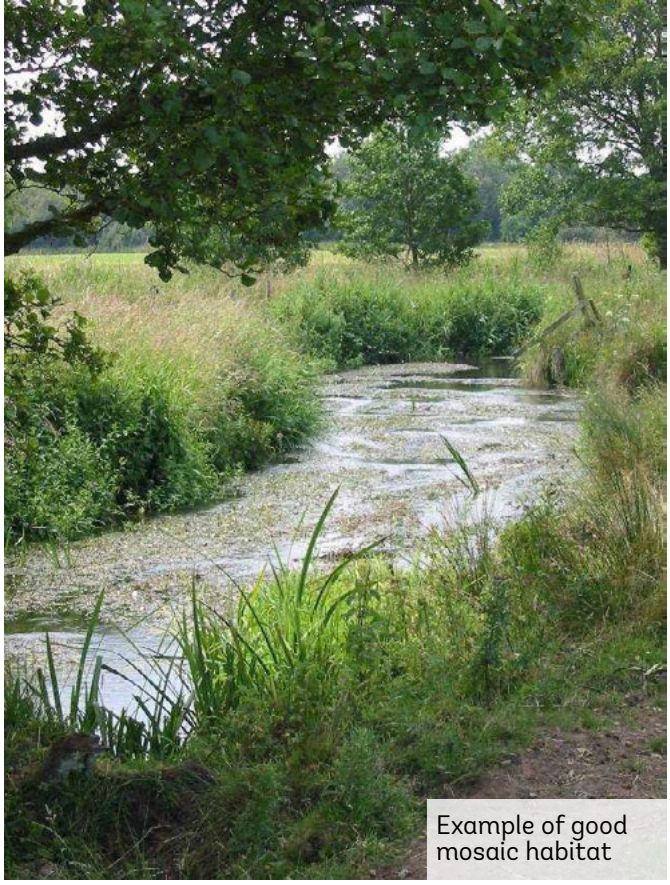
Catchment tree planting

The Environment Agency set up pilot catchments to look how best to implement tree planting for creating riparian shade. This trial project won the Green Apple award for its best practice at managing the impacts of climate change. One of these is along the Hampshire Avon. The project started in January 2013 and gathered momentum quickly, with 200 trees planted on the River Avon just north of Salisbury by April of the same year. The river is considered by many to provide the best salmon and trout fishing in southern England.

The project is in a densely populated area that features towns, villages and farmland, as well as a vast number of different landowner and fishing clubs, so stakeholder engagement is vital to its success. This is achieved through the work of a dedicated Project Officer, Leanne Sargeant, who engages directly with stakeholders and contractors.

PETER TRIMMING-WIKIMEDIA COMMONS

Water vole



LEANNE SARGEANT

Example of good mosaic habitat

The Hampshire Avon was selected as one of the pilot areas because of its complex nature. It is a chalk river with an upper and lower split. The lower section of the river is especially important in the Avon Valley for over-wintering and breeding waders. It is designated a Special Protection Area under European Legislation for these birds. There are aesthetic constraints of local heritage archaeological sites and fishing is often restricted to banksides, so maintaining access for anglers is vital.

Guidance for Keeping Rivers Cool recommends planting in the headwaters of rivers to cool the water at source. These would have been the areas that were more wooded in the past as they were less suitable for farmland than areas further downstream. However, the Hampshire Avon catchment is very long and it was felt while shading in the upper catchment would be good, the lower reaches would benefit from cool thermal refuges for fish migrating up the river system. Balance has to be found between creating woodland strips for cooling water and maintaining open areas for the breeding waders that also supports the restoration of water meadows and species rich grassland.

Identifying key areas

Priority planting sites were identified using Environment Agency riparian shade maps. One such site was Little Durnford, Wiltshire, where the river is widely used by the Salisbury and District Angling Club. Working with the landowner and the angling club key planting areas were pinpointed. Working closely with these major stakeholders meant their needs were taken into account, such as the views from the landowner's home, and important spots for fishing and hatching. Through their engagement the landowner and angling club were able to see the benefit of trees creating good habitat for salmon and other fish through the creation of shade, feeding habitat and shelter.

Stakeholder response is particularly important in the Hampshire Avon, due to the high population density of the area. River users have been pleased with the results of the project:

LEANNE SARGEANT

Little Durnford after planting

LEANNE SARGEANT

Little Durnford before planting

"I am very happy with what has been achieved and have no doubt it will benefit the river environment without impacting adversely on our anglers. Many thanks." Vice chair, Salisbury and District Angling Club.

Natural regeneration of trees in this area is limited due to the heavy presence of rabbits and deer, so the Hampshire Avon valley needs trees to be actively planted. At Little Durnford a mix of native broadleaf trees was planted and guards protected them from herbivore grazing. Fencing was then installed to keep cattle away. Supervision of these sites was essential to ensure planting did not adversely affect wildlife, including the local water vole, *Arvicola amphibius*, population. Those stretches of bank containing water vole burrows were not planted.

Evidence gathering

The pilots are pulling together good evidence of how to implement planting, including things to watch out for, such as water voles. It has helped identify funding for the projects, which species to use and the number of trees needed to create good shade, but also how to maximise on the multiple benefits tree planting can offer. For example, where there are surface flows of water a buffer can help slow the flow

into the river, this helps delay flood peaks. Woodland buffer strips can also be good for reducing sediment run-off into watercourses, helping reduce diffuse pollution. These woodland strips also provide corridors that link habitats and enable many invertebrates and mammals to move between them.

Over the next few years the Environment Agency's award winning project, Keeping Rivers Cool, is going to be rolled out to all catchments across England to help mitigate climate change impacts. The key message is the creation of a habitat mosaic; not only riparian woodland, but a healthy environment which contains a mix of many habitats. The thrust of Keeping Rivers Cool is to help cool water temperatures for trout and salmon, but the benefits are clearly wide ranging.

[1] *Jenkins, G.J., Perry, M.C., and Prior, M.J. (2008)*

[2] *Webb, B.W. & Nobilis, F. (1997)*

[3] *Elliott, J. M. & Elliott and J. A. (2010)*
[4] *Peterken, G.F., Hughes, F.M.R. (1995)*

[5] *Bowler, D.E., et al.(2012) & Caissie, D. (2006)*

Lake District – flood prevention & soil protection

The Lake District is famous for its spectacular scenery, sheep farming and wet climate. The now mostly bare slopes would once have been covered in trees, but Viking settlers began clearing the land and introduced the hardy Herdwick breed of sheep. This tradition of farming sheep continued and grew over the centuries. As more trees were felled, for fuel and building materials, and more sheep added, the Lakes underwent a gradual transformation and, while the familiar upland landscape is valued and revered by many, in ecological terms much of it is very degraded.

Many years of grazing, sometimes by excessive numbers of livestock, has led to vegetation change in the Lakes and other upland areas, preventing natural regeneration of trees and leading to a ground cover dominated by grasses. Along with the removal of trees this has caused a serious reduction in biodiversity, both flora and the wild fauna that depends on it, and soil productivity. It also removes the essential mechanical support that root structures provide to hold soil layers together, leading to erosion.

TIMOTHY NICHOLSON

Tebay's denuded landscape

Trampling by livestock causes ground compaction that prevents water absorption and increases surface water run-off, and a lack of vegetation/roots means that same water erodes the valuable top soils as it flows across the ground. In the Lakes rainfall is high and can be heavy; this coupled with steep slopes results in the loss of large quantities of soil each year. The soil laden water flows down into watercourses, polluting them with sediment that reduces dissolved oxygen levels and smothers aquatic plants. It also runs into populated areas, flooding homes and roads.

Trees as restoration tools

Trees can have multiple benefits for land and water. Their leaves and branches intercept rainfall, allowing the ground beneath more time to absorb the water, while the roots enable water to better infiltrate the soil. The roots also aerate the soil and hold it together, increasing its stability and preventing erosion. Trees capture carbon and nutrients and their leaves, once fallen and decomposed, help to create a fertile humus layer.

Riparian trees stabilise banks along watercourses, preventing them eroding during peak flows, and capture sediment running off slopes, reducing the amount polluting rivers and lakes. Trees are also beneficial to aquatic life. They shade watercourses, reducing temperatures and therefore increasing the concentration of dissolved oxygen. Invertebrates feed on the decomposing leaves that fall into the water; they in turn feed the fish, that themselves feed birds and humans.

In terms of livestock, trees offer shade and protection from heat stress, and shelter from

TIMOTHY NICHOLSON

Soil erosion at Tebay

adverse conditions such as high winds and heavy rain and snow. They also help to keep the ground warm which increases the grass growing season and provides more food for grazing animals. For landowners and farmers trees can provide valuable woodfuel and timber resources.

Tebay Common

Work is now being carried out to restore and regenerate areas within the Lakes and surrounding upland areas supported by the Higher Level Stewardship (HLS) scheme. Tebay Common is one such area. The Woodland Trust has been working in partnership with Natural England and the local landowner to re-establish a more treed landscape that will support natural processes, such as soil protection/creation and water management.

PETER LEESON

Sensitive planting on Tebay's steep slopes

Tebay common is spread over 1,000 hectares and, although it is privately owned by the Lowther Estate, commoners hold traditional registered rights of commons. The most significant right still used today is access for livestock grazing. Historically commoners would also have had rights to peat (turbary), acorns and beechmast (pannage), wood for house repairs (haybite) and fish from the waters (piscary).

South-east facing slopes dominate the common. The lack of vegetation on these steep slopes allows large volumes of water during heavy rainfall to flow down them almost unhindered, washing soil along too. Along the bottom run the River Lune, the M6 and a railway line. As the valley links Lancaster to south Cumbria it has been an important communications corridor for centuries. The sediment-laden water floods the bottom of the valley, affecting homes and transport links, and polluting the river.

One positive outcome of the foot and mouth outbreak of 2001 was an increase in biodiversity. Fewer walkers and dogs on the fells meant less disturbance to ground nesting birds and improved breeding success. Lower grazing pressures allowed more plant species to flower and seed. The fences that were erected to separate flocks and create sanctioned zones made exclosures, some of which have yet to be removed, in which birch, heather and bilberry are now re-colonising the land.

Consultation and funding

Scoping studies were initially carried out by the partnership to assess landowner and farmer interest in the scheme. Various roadshows demonstrated how HLS could increase biodiversity while also providing a valuable income to the farmer/landowner. The results of a consultation to ask people how they thought wildlife could be increased found tree and shrub planting was key for many.

The Lakes are seen as a priority area for HLS funding. A Farm Environment Plan (FEP) was drawn up for Tebay with a baseline ecological survey. The FEP concluded that Tebay was 86 per cent denuded, with only 14 per cent restorable habitat. In this context, restorable means 'an area of habitat which, within the confines of a ten year agreement, can be shown to make improvements through management practice'. Therefore, the other 86 per cent was not hopelessly damaged, but it would not show an improvement within ten years. This indicates how ecologically poor areas of the uplands have become but also how much recent practice has potentially reduced their resilience and use to mankind in the future.

The HLS option can be offered by Natural England where gains in habitat condition could be met through revised land management. At Tebay 11 per cent of the common land was allocated for scrub woodland creation giving Natural England a strong case to fund the work as 25 per cent of the common (including the 14 per cent 'restorable' habitat) would be heading towards restorable condition. HLS dictates that there can be no more than 3 hectares of woodland in the scheme, but it does allow for scrub and successional areas with low densities of scrub trees per hectare, essentially becoming wood pasture. Densities required are much lower than the 1,600 trees per hectare desired by the Forestry Commission through the England Woodland Grant Scheme – the ecological benefits of scrub dictating these lower densities. Scrub and wood pasture are highly valued habitats on high ground, giving shelter, berries and nectar to a range of specialists and seasonal migrants alike.

Commons legislation has a long pedigree. A key point within the legislation requires that any exclosures (new walls or fences) are consulted on between interested parties and approved by the Secretary of State. Often the consultations include those holding rights to graze the common, such as landowners, archaeologists and landscape groups, as well as access and recreation groups. Thus planning new fences within HLS schemes often requires sympathetic design and wide consultation. For example, all of Tebay's 23 graziers (active or not) had to be located and on board. The need for fences comes back to the point that

Planting Design 2012

restoration of the land is often only possible by reducing stocking levels, altering the animals grazing (from sheep only to cattle and sheep) or excluding livestock altogether.

Not all the animals that can cause damage to young trees are domesticated of course and deer, of which there are many in the Lakes, are a particular concern. In the first instance they need to be monitored and, only if they cause unacceptable levels of damage, culled.

Also, although it is the farmers that are granted the HLS they need the agreement of the landowner, and all trees and woodland on the common are owned by the landowner. Through the HLS the farmer receives a baseline single farm payment, plus two potential additional payments of £100 per hectare for livestock exclusion and £100 per hectare for tree/shrub planting.

Planting and stocking

The restoration project is in its first phase, with 50 ha now fenced off and being planted. Hawthorn, *Crataegus monogyna*, hazel, *Corylus avellana*, rowan, *Sorbus aucuparia*, birch, *Betula sp.*, oak, *Quercus sp.*, willow, *Salix sp.*, and alder, *Alnus glutinosa*, with the odd crab apple, *Malus sylvestris*, and aspen, *Populus tremula*, will be planted in tree boxes to protect them from grazers – deer are also a significant problem in the Lakes. Cattle have been introduced and sheep taken off for the winter – fewer sheep will come on next spring to help reduce grazing pressures and compaction.

Tebay is highly visible from the road so the scheme should attract attention, allowing people to see the changes over time as the trees grow and ground flora diversity increases. It will have a positive impact on the Lune and its tributaries, and the biodiversity within them. As a major salmon river this will help support a species that brings valuable income and visitors to the area. It will also reduce flooding and protect/create fertile top soil that is vital for wildlife and farming.

Pontbren project – sustainable upland farming

The Pontbren Project is an innovative approach to using woodland management and tree planting to improve the efficiency of upland livestock farming. The impetus for the project came from three neighbouring farmers who in 1997 were trying to make their farm businesses more sustainable by planting hedges and trees to provide more shelter for livestock grazing the steep, windswept land.

Pontbren

WTPL-RORY FRANCIS

Restoring a treed landscape

The results and the evident benefits of a collaborative approach attracted neighbouring farmers. In 2001 the Pontbren farmers came together as a group of ten, managing a total of 1,000 ha of farmland across the catchment of Pontbren Stream, near Llanfair Caereinion in North Powys, a headwater of the River Severn. The key factor in the success of Pontbren has been the farmers - collaborating as a group, but each remaining firmly in control of the management decisions on their own land.

Located in one of the wettest areas of the UK, the land they farm ranges from 200 to 400m above sea level. In the 19th and 20th centuries the structure of upland Welsh farming moved away from small-scale mixed farming towards sheep farming on grassland, with some suckler beef and a little dairy.

The majority of land was ploughed and re-seeded from the 1970s. Many hedges were removed to make larger, more manageable fields, and woodland became unused and neglected over time. This simplification of the landscape had negative consequences for wildlife and ecosystem services, such as increasing run-off during heavy rain that caused flooding.

Farmer-led innovations

Taking a pragmatic approach, in the 1990s the farmers began planting hedges and trees to provide shelter for their livestock. They hoped to make their business more efficient by protecting sheep and cattle from the less hospitable elements of the windswept upland environment. Their aims were to reduce costs and make the land more environmentally sustainable.

The farmers identified key areas for shelter planting and carried out some of the work themselves; the rest was contracted out to local businesses. Trees and shrubs were planted to give variable structure, providing effective but slightly wind-permeable shelter. The work also enabled them to adjust a number of field boundaries, fencing out steeper more difficult to manage areas and improving access for stock gathering.

They recognised the need to choose robust trees and shrubs that could cope with the upland conditions as well as the hardier sheep. Coed Cymru helped advise on a good range of broadleaf species that would cope with the ground conditions, provide all-year-round shelter and be resilient to climate change. Some of the planting stock was grown by the farmers themselves in their own nursery and some acquired from local suppliers.

Broadleaf trees were planted in the middle of the shelterbelts at higher densities than is usual. A large number of shrubby hedge species were planted either side to give more rapid shelter before the woodland understorey develops – these can easily be coppiced in the future.

The species chosen fall into three role groups:

- Quick-growing pioneer tree species which thrive in open conditions such as silver birch, *Betula pendula*, downy birch, *B. pubescens*, rowan, *Sorbus aucuparia*, and on wetter areas black alder, *Alnus glutinosa*, and for the most exposed sites aspen, *Populus tremula*, and willow, *Salix spp.*, but planting the latter away from field drains which the roots might block;

WTPL-RORY FRANCIS

Shelterbelt planting

- Long-lived but slower-growing large trees that will provide timber in 40–100 years' time, for example sessile oak, *Quercus petrea*, the native oak of the western uplands of Wales, ash, *Fraxinus excelsior*, an important woodland species which survives at higher altitudes than oak in Wales, and sweet chestnut, *Castanea sativa*;
- Easily coppiced shade tolerant shrubs that will do well inside the wood, especially hazel, *Corylus avellana*, and holly, *Ilex aquifolium*, and on the edges where there is more light, bird cherry, *Prunus padus*, field maple, *Acer campestre*, hawthorn, *Crataegus monogyna*, and blackthorn, *Prunus spinosa*.

Trees prove successful

Ten years on, 120,000 trees and shrubs have been planted, 16.5 km of hedges have been created or restored and nearly 5 per cent of Pontbren land is now woodland – and still they plan to do more. Significantly, no agricultural productivity has been lost. Woodland and hedgerow renovation has provided a good supply of timber and firewood, and some was chipped to use for livestock bedding.

Tree planting has not just improved farm businesses and wildlife habitats, but has reduced water run-off during heavy rain. The farmers noticed their tree planting was reducing surface water run-off and encouraged independent research to confirm this. Over the past 15 years their innovations have been subject to more field research on the environmental benefits of farm woodland than anywhere else in the UK.

This internationally important research has shown that strategically located trees are effective at reducing the amount of water running off upland grasslands, reducing the threat of flooding further down the catchment. Trees have sent their roots deep into the soil, stabilising it and allowing water to infiltrate more efficiently along the paths the roots have created.

Researchers found that compared to sheep-grazed grassland, excluding sheep produces on average a five fold improvement in infiltration rates, but excluding sheep and planting broadleaved trees is on average 67 times more effective than improved, grazed grassland at absorbing surface run-off. They also showed that, in the right place, tree shelter belts on improved land can reduce peak flows by around 40 per cent.

Key lessons

Trees and woodlands are now an integral part of farm management in Pontbren, demonstrating the benefits for upland livestock farming, water management, wildlife and landscape. Key lessons from the Pontbren Project are:

- Broadleaved woodland and shelterbelts can make the management of upland farms more efficient.
- Planting and management of woodland and hedgerows on improved upland grasslands has wide environmental benefits for water management and flood risk, biodiversity and landscape – benefitting birds (including 12 of conservation importance, such as the kingfisher, *Alcedo atthis*).
- Critical to achieving environmental benefits of tree planting is the strategic and well-informed choice of locations, species and management, based on knowledge of the site.

ANDREAS TREPTE-WIKIMEDIA COMMONS

Kingfisher

- Conventional agri-environment and woodland grant schemes do not have sufficient flexibility to support targeted, site-specific, collaborative environmental actions led by groups of farmers and landowners.
- Farmer-led groups who follow the Pontbren model need access to the services of skilled facilitators and technical advisers.
- The research illustrates how important field based experiments and observations are in understanding complex hydrological and biological processes.

Twelve new ponds were also created to hold excess water, rather than attempting to increase drainage in the persistently wet areas. Sections were fenced off and excavated. These now provide additional supplies of water piped to nearby fields.

The undoubted success of Pontbren in agricultural, environmental, scientific and social terms has provided a well-tested model for farmers and policy makers seeking a better way of delivering essential environmental services as part of productive upland livestock farming in the UK. The Pontbren project worked because it was led throughout by the farmers who took an innovative approach, and who were willing and able to interest and involve others in active collaboration.

While understanding the science is vital, the key to action has been the knowledge and collaboration that the farmers brought to the project, supported by locally based advisors. The full Pontbren Project report can be accessed via the publications section of the Woodland Trust website: woodlandtrust.org.uk

Severn Rivers Trust – catchment sensitive farming

The Severn Rivers Trust is an independent environmental charity established to secure the preservation, protection, development and improvement of the rivers, streams, watercourses and water bodies in the Severn catchment, and to advance the education of the public in the management of water and the wider environment. Part of their work has included the planting of trees and creation of woodland, this contributes to the Water Framework Directive (WFD).

Leam Catchment Riparian Tree Planting Project

The Leam catchment spans parts of Northamptonshire and Warwickshire. It covers an area of 360km2 and includes five main waterbodies - the River Leam (which joins the River Avon in Warwick), River Itchen and River Stowe, and the Rains and Radford Brooks. The catchment is mainly rural with two urban

IAN ROB-WIKIMEDIA COMMONS

River Leam flooding

centres – Southam and the eastern edge of Royal Leamington Spa.

Monitoring of the catchment's waterbodies for the WFD showed them to fail in several areas. The key issues preventing them achieving Good Ecological Status involved phosphates, pesticides and sedimentation, mainly caused by runoff from industrial, agricultural and domestic land. This is an issue for wildlife but also for the local population whose drinking water is supplied by the catchment.

The causes of the problem include livestock heavily poaching riverbanks and damaging riparian vegetation with poor structure, which resulted in large quantities of sediment entering the river. The roots of plants and trees bind the soil together and make it structurally stable, without them topsoil can easily be washed away – especially during periods of heavy rainfall.

Four farms in the catchment were identified as contributing to issues of water quality. Three of the farms bordered the River Leam or had it running through their land, and one bordered the River Itchen. The local Catchment Officer, Melissa Hoskins, identified them through Catchment Sensitive Farming visits and held discussions with the farmers.

Farming issues

Farms are important elements of rural life, but some practices can cause issues and a balance needs to be found between successful farming and environmental health. At one farm livestock previously had open access to the River Leam, but were poaching the banks. This led to poorly structured vegetation and

MIKE MORRIS

Severn Rivers - before planting

contributed to substantial levels of sediment entering the river. There was a similar story at another livestock farm along the River Itchen.

At Frankton Grounds Farm sheep had caused the complete removal of vegetation and top soil along areas of the River Leam. This in turn caused bank subsidence and loss of land. Horses (30-40) at Redhouse Farm livery along the River Leam had heavily poached banks and damaged riparian vegetation. Frequent flooding had also restricted the use of paddocks for grazing.

Advice was given on the poaching of riverbanks by livestock, promoting fencing as a way to limit further soil erosion and loss of valuable top soil, and to reduce sedimentation in the river. Tree planting was also recommended to help maintain the structure of the bank, provide valuable shade for the river, create habitat for wildlife, and to act as a buffer to

MIKE MORRIS

Severn Rivers - during planting with volunteers

reduce the amount of phosphate entering the watercourse. Flood risk consents were completed to ensure any work would not cause adverse flooding of the farmland or land further downstream.

Tree solutions

In March 2013, the project planted 3,515 native broadleaf trees, covering 10 hectares, of local provenance along the banks of watercourses and across the above four farms in the catchment. Species selection was guided by the Woodland Trust, who also provided some funding, and Warwickshire County Council Ecology Department. Scrub species were distributed evenly among the larger trees to create structure and protection.

Riparian fencing was also erected using funding from the Environment Agency. This restricts livestock access to the waters edge and reduces the risk of them damaging the newly planted trees. The fencing was erected using local contractor Tom Reeve, while Blue Skies Tree Services planted the trees.

Frankton Grounds Farm has benefitted from 1500 trees planted along a 2050m reach of the River Leam. Watercourse fencing was erected along the same stretch, with the provision of a drinking bay to allow sheep and horses access to a restricted area of the river. In addition to this, 100 trees were planted and 550m of riparian fencing installed on a farm upstream of Frankton; while a further 1800 trees were planted downstream on the floodplain meadows at Red House Farm. The livestock farm adjacent to the River Itchen has also benefitted from over 115 trees and 150m of riparian fencing.

Tree species planted at each site and the associated percentage mix:

	% mix
oak (*Quercus Robur*)	10%
alder (*Alnus Glutinosa*)	10%
crab apple (*Malus sylvestris*)	10%
hazel (*Corylus Avellana*)	10%
field maple (*Acer Campestre*)	10%
blackthorn (*Prunus spinosa*)	5%
hawthorn (*Crataegus Monogyna*)	5%
spindle (*Euonymus europeus*)	5%
willow (*Salix alba*)	10%
black poplar (*Populus nigra*)	10%
aspen (*Populus tremula*)	10%
hornbeam (*Carpinus betulus*)	5%

The benefits of tree planting include:

- Binding the banks together and reducing levels of sediment entering the river and covering river gravels used for spawning fish.
- Reducing influx of sediment will benefit macrophytes.
- Improving substrate composition will subsequently provide benefits for macroinvertebrates and phytobenthos.
- Reducing volumes of phosphate entering the rivers locked to soil particles.
- Increasing shade to help reduce water temperatures and increase dissolved oxygen levels.
- Increased shading will also provide long-term benefits to the waterbodies by helping to relieve the effects of climate change.
- Reducing light levels through shading will reduce periphyton (a complex assemblage of algae, cyanobacteria, microinvertebrates, their secretions, and detritus attached to submerged surfaces) accrual rate and help to reduce the risk of eutrophication.
- Holding the soil structure together to allow pesticides to be absorbed into soil and degraded naturally.
- Allow the natural development of riparian vegetation, which will subsequently provide shelter for juvenile fish, a habitat for macroinvertebrates and phytobenthos, and help to "clean" the water.

The project was an overall success and the landowners and catchment officer were impressed with the standard of work delivered. Monitoring is taking place in the catchment to assess the benefits of the tree planting and fencing. This will be a long-term monitoring programme as it is likely to be a number of years before some of the benefits to water quality can be fully assessed. However, it is already evident that the work has reduced the volume of sediment entering the rivers at these sites; a very positive result. A similar project was carried out at the same time within the Teme catchment, where trees were planted in field corners to reduce surface water run off.

Example of a healthier area of the River Itchen

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